4.3.2 WATER DELIVERY IMPROVEMENTS BY WATER SUPPLIERS

The majority of water applied to fields is obtained from water districts, which obtain most of their water from surface diversions (DWR 1994). Surface water supplies are actively distributed and delivered to fields and farms in a district's service area. Distribution and delivery have been the primary job of the water district for many years. Only recently, has the district begun to assume the role of water supply management It can be noted that districts with typically limited water supplies or high water costs already have taken on the role of water management. Other districts, especially those with ample supplies, still maintain the "delivery only" paradigm. The Water Use Efficiency Program will increase the availability of planning assistance, technical assistance, and funding so that more districts can expand their role to include water supply management, not only delivery.

Distribution of large quantities of surface water is inherently difficult and challenging. In contrast to urban water deliveries, most agricultural water delivery systems are not pressurized or available on demand. (Research to provide on-demand supplies is under way, but such delivery methods typically are cost prohibitive). Instead, large networks of canals rely on gravity to distribute the water. Some water districts in California have new, more manageable systems, including pressurized pipelines, but many districts have gravity systems originally constructed during the early part of this century. Many of these existing water delivery systems need to be upgraded in order to improve the ability of the district to meet more sophisticated needs of their customers, the end user.

Existing Delivery Systems

Like on-farm systems, district delivery inefficiencies are a result of the type of system, availability of water, climatological conditions, management, and maintenance. Losses incurred while delivering water result primarily from four sources:

- Conveyance seepage
- Canal spillage
- Gate leakage
- Conveyance consumption (channel evaporation and bank and riparian ET)

Conveyance seepage originates from water supplier channels and reservoirs where seepage flows directly to groundwater bodies. Canal spillage includes discharges from district end points and drainage courses, and can flow to surface water or groundwater bodies. Gate leakage is water that leaks through the last gate or check structure of a water supply channel. The location of the last gate can vary along the channel with daily demands. Gate leakage is typically small and, as such, usually seeps through channel bottoms into groundwater bodies or evaporates. Conveyance consumption represents consumptive uses of water along supply channels and reservoirs, including evaporation from water surfaces and ET of riparian and bank vegetation (DOI 1995).

Projected Improvement under the No Action Alternative

Recent efforts by agricultural water suppliers, environmental interest groups, and other interested parties have resulted in the development of the Memorandum of Understanding Regarding Efficient Water Management Practices by Agricultural Water Suppliers in California (Agricultural MOU). This MOU is designed to create a constructive working relationship between these groups and to establish a dynamic list of EWMPs for implementation by water suppliers. The goal is to voluntarily achieve more efficient water management by water suppliers and end users than currently exists.

It is anticipated that many agricultural water suppliers will sign the Agricultural MOU and complete the planning requirements. However, implementation levels of EWMPS may occur below the maximum potential. This is based, in part, on resource limitations (both dollars and people) currently experienced by most districts and lack of interest in participating by some water suppliers. The Water Use Efficiency Program includes planning and technical assistance, as well as additional funding and assurance mechanisms, designed to address these shortcomings.

Slightly over 8.5 million acres of irrigated lands are located in the CALFED Program's geographic scope (there are slightly under 9.1 million irrigated acres in the state) (DWR 1998). With the Agricultural MOU being finalized at the start of 1997, 39 water suppliers representing almost 3.3 million acres already have signed. However, current signatories represent about 30% of the potential. Assuming that the number of water suppliers who become signatories may increase only moderately by 2020, total signatories to the MOU may add up to around 4 million acres. Implementation of all cost-effective measures also is anticipated to fall short of the potential under the No Action Alternative (based mostly on limited funding and assistance resources)

In recent action taken by the Agricultural Water Management Council (AWMC), administrator of the Agricultural MOU, additional opportunity for many more acres to sign the MOU has been made available. The AWMC voted to automatically endorse CVP contractors whose plans have been approved by Reclamation on or before November 16, 1998. This action provided an opportunity for many CVP contractors who had not signed the Agricultural MOU, citing concerns of "double jeopardy," to join other water districts as signatories. In total, plans of 51 CVP contractors have been approved by Reclamation (or are currently being approved), representing over 1.6 million acres of additional irrigated lands. If all of these contractors became signatories, the Agricultural MOU would include over 80 water districts representing 4.6 million acres of irrigated agriculture.

Estimated No Action Alternative conservation attributed to district activities is presented in Section 4.7, "Estimating Agricultural Water Conservation Potential."

Additional Improvements as a Result of the CALFED Program

The Water Use Efficiency Program is anticipated to provide the assistance necessary to gain higher levels of EWMP implementation and participation by more agricultural water districts. Incentives, coupled with assurance mechanisms, will encourage more districts to properly examine the benefits of the EWMPs and implement the cost-effective measures. It is assumed that such measures will result in a significant majority of the water suppliers planning, adopting, and implementing feasible, cost-effective efficiency measures.

Estimated No Action Alternative conservation attributed to district activities is presented in Section 4.7, "Estimating Agricultural Water Conservation Potential."

4.4 IRRECOVERABLE VS. RECOVERABLE LOSSES

Except for a negligible amount of water required for plant metabolic processes, agricultural applied water can be accounted for by the various demand elements presented in Figure 4-6. The "consumptive" elements (crop ET, on-farm evaporation, and conveyance consumption) are lost to the atmosphere and generally not recovered.

Tailwater, deep percolation, conveyance seepage, canal spill, and gate leakage flow to surface water or groundwater bodies and may be recoverable. In theory, all these losses are recoverable. In practice, however, losses that flow to very deep aquifers or excessively degraded water bodies may not be recoverable because of prohibitively expensive energy requirements (they become irrecoverable). Determining recoverability varies with location and time, as well as other factors (DOI 1995).

Collectively, losses are composed of irrecoverable and recoverable portions. Distinguishing between irrecoverable and recoverable losses is based largely on water quality considerations. These losses will vary from location to location, with some areas generating minimal or even no irrecoverable portions while other areas may generate irrecoverable losses almost exclusively. Principal water bodies that are regarded as irrecoverable include saline, perched groundwater underlying irrigated land on the west side of the San Joaquin Valley; the Salton Sea, which receives drainage from the Coachella and Imperial Valleys; and the ocean. Therefore, losses that flow to these areas are deemed irrecoverable.

Conserving irrecoverable losses generally is considered to make water available for reallocation to other uses. In some instances, however, reduction of recoverable loss also may provide a water supply benefit in the basin where it was conserved—this benefit may be limited and subject to existing water rights law.

Recoverable losses, on the other hand, often constitute a supply to the downstream user (the loss is recovered and is still available to meet other water supply needs). Downstream uses can include groundwater recharge; agricultural and urban water use; and environmental uses, including wetlands, riparian corridors, and instream flows. Recoverable losses often are used many times over by many downstream beneficiaries. To reduce these losses would deplete such supplies with no net gain in the total water supply, unless the reduction was experienced throughout the basin, when the reduction might constitute an available supply for other uses in the basin.

Reducing recoverable losses primarily provide significant opportunities to contribute to the achievement of other CALFED objectives, such as:

- Improve in-stream and groundwater quality through reduced deep percolation or runoff of water laden with residual agricultural chemicals, sediments, and natural toxicities.
- Reduce temperature impacts resulting from resident time of water on fields prior to runoff returning to surface waters.
- Reduce entrainment impacts on aquatic species as a result of reduced diversions.
- Reduce impacts on aquatic species, especially anadromous fish, through minor modifications in diversion timing, and possibly generate in-basin benefits through subsequent modifications in the timing of reservoir releases.
- Benefit stream reaches that may have previously been bypassed as a result of excessive diversions.

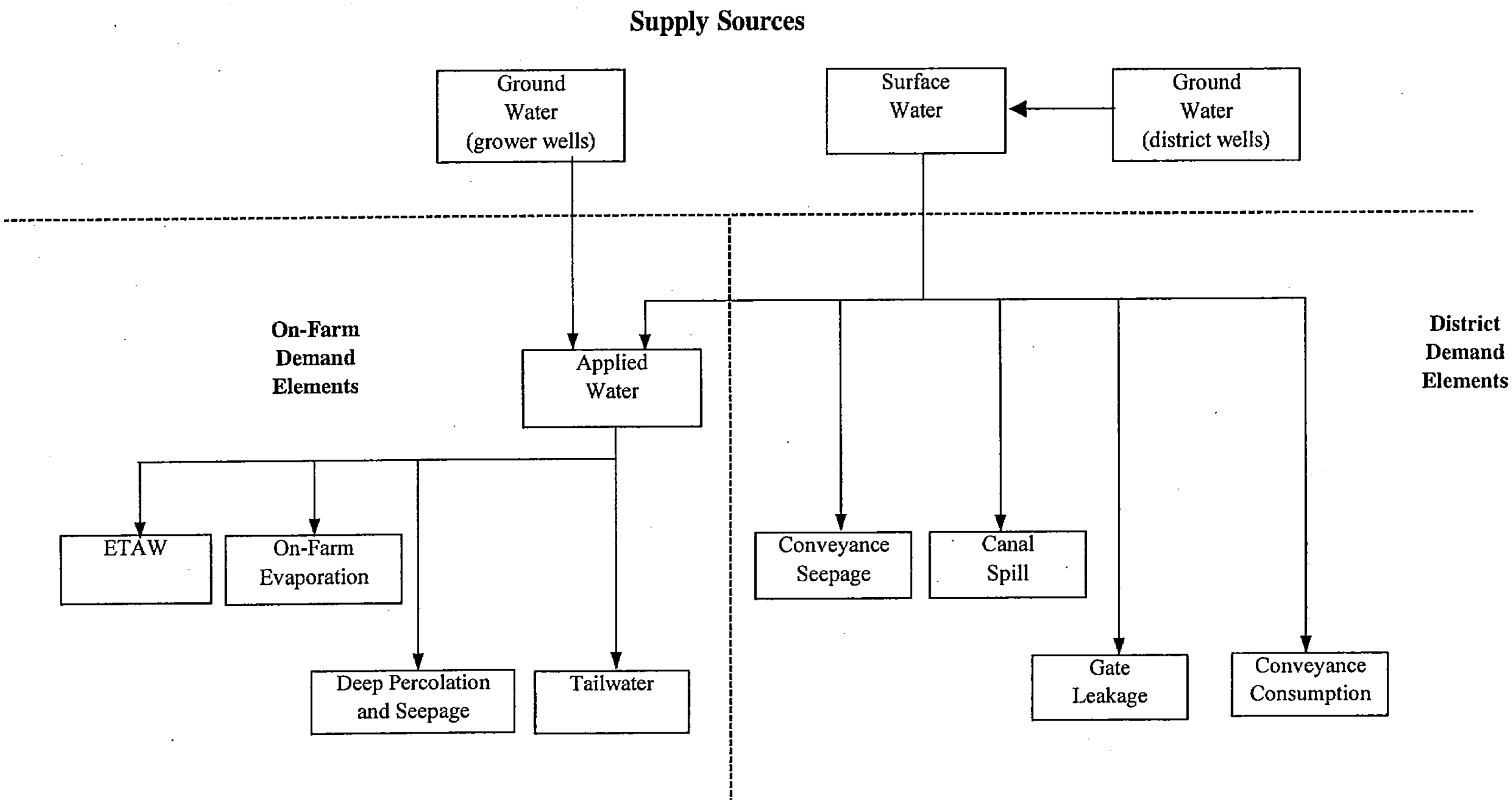

Figure courtesy of the Bureau of Reclamation - Mid Pacific Region from the *Demand Management Technical Appendix #3* to the *Least-Cost CVP Yield Increase Plan*

Figure 4-6

Example Demand Elements

Water supplied to agricultural fields can result in one of several demand elements. The efficiency of delivery and application systems dictates how much goes to each element.

In general, the same water use efficiency measures available to reduce recoverable losses can be used to reduce irrecoverable losses, although the various measures may be implemented for differing objectives. The primary purpose for separating the two is to distinguish the difference in ability to generate water supplies that can be reallocated. Reallocation of recoverable losses to out-of-basin uses could result in impacts on other diverters or the environment. This is described in more detail later under Section 4.5, "Hydrologic Interconnections."

Although the potential for conserving existing losses can appear significant, the benefit to water quality or the ecosystem is not necessarily one for one. For example, an 8-12% reduction in applied water does not necessarily result in the same percentage of improvement in water quality. Results could be greater or less, depending on local circumstances. For example, applied water reductions may be assumed to be spread throughout an irrigation season. Water quality impacts that accompany the irrigation may be concentrated in particular days or months occur under particular flow conditions, or be associated with particular farm management activities (such as spreading fertilizer or pesticides). Reducing applied water may result in only minimal benefits during certain periods and more significant benefits during other periods. More research into these relationships is necessary and is a prominent part of the Water Use Efficiency Program (see Section 2 for a description of the element's recommended actions).

It is assumed that implementation of conservation measures will not result in redirected impacts on the water user or water supplier. For example, a measure would not be implemented if the water user would experience increased production costs with no subsequent direct benefit. However, the influence of outside interests to offset these impediments for a "win-win" situation is assumed to occur when and where appropriate. Outside participation in planning, funding, and implementation can help make efficiency measures locally cost effective when they otherwise might not be. Benefits also are assumed to be shared when costs are shared, whether gained by the water user, the water supplier, or the environment. As discussed in Section 2 of this document, one of the agricultural water use efficiency actions is management improvements to achieve multiple benefits. This action is intended to help identify and implement such opportunities, expanding on processes contained in the Agricultural MOU.